GeoHealth2006: Methods in Practice
28th–30th November 2006
Nelson, New Zealand

"Clean and healthy to breathe" - Air pollution and environmental justice in New Zealand

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Environmental Justice

- "equal access to clean environment and equal protection of issues of environmental harm irrespective of race, income, class or any other differentiating feature of socioeconomic status" (Cutter, 1995)
- Important because: socially disadvantaged + raised levels of air pollution = susceptibility to the health effects of pollution exposure
- Most research on industrial pollution and in North America
- Little on particulates
- Spatial estimates of pollution often poor

Aims

- Examine equity issues associated with levels of air pollution, specifically PM_{10}, in New Zealand
  - To examine whether disadvantaged groups in New Zealand were more likely to be exposed to higher levels of pollution
  - To estimate to what extent people living in different areas contribute towards the levels of air pollution.

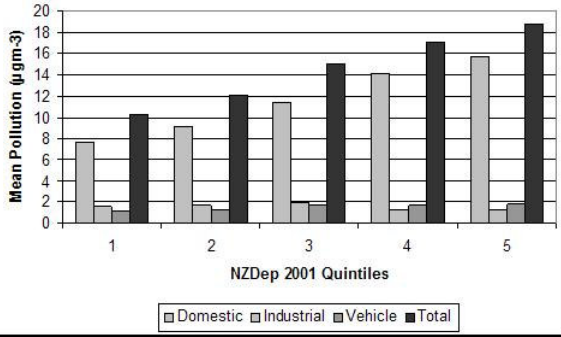
Previous research

- Christchurch – most studied city
  - 300,000 people
  - PM_{10} problem
  - Average of 30 NES exceedances per year
  - Primary cause is wood burning for home heating (winter)
  - Good estimates of PM_{10}

Previous research

- Domestic pollution
  - Pearce J, Kingham S and Zawar-Reza P, 2006, Every Breath You Take? Environmental Justice and Air Pollution in Christchurch, New Zealand. Environment and Planning A, *38, 919*
- Traffic pollution
  - Kingham S, Pearce J and Zawar-Reza P, 2006, Who breathes in the dirtiest air, and who causes it? Traffic pollution and poverty in Christchurch, New Zealand. Environment & Transport : 2nd International Scientific Symposium (including 15th conference Transport and Air Pollution), Reims, France, 12th-14th June 2006.

Previous research



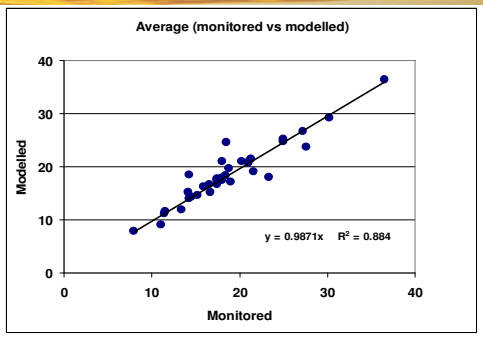
Previous research

- *Poor* breathe worst air
- BUT…
- *Rich* have most fires
- *Rich* have most cars

National study

- Health and Air Pollution in New Zealand (HAPiNZ) study.
- Exposure estimates for PM_{10} derived for all urban areas of NZ
- Sub-divided by domestic, traffic, industry and background
- Based on *available* data for Census Area Units (CAUs) using GIS
- Includes chimney density, traffic density, major industries, topography, meteorology etc.

Model



Method

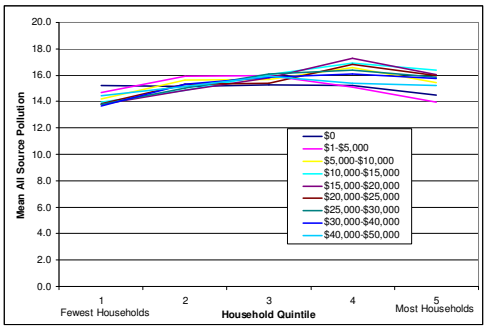
Demographic and socioeconomic data

- Census data for 2001 for Census Area Units (CAUs)

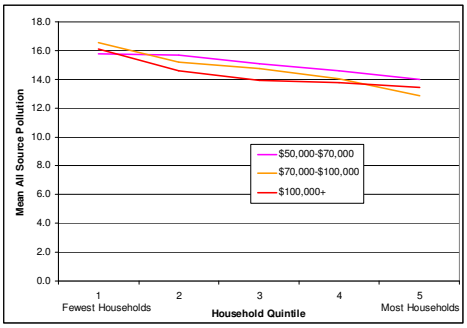
Pollution estimates calculated for different:

- Income - different household income groups
- Social deprivation - New Zealand Deprivation Index (NZDep 2001) (Salmond and Crampton, 2002)
- Different areas
- Future - ethnicity - four largest ethnic groups in New Zealand (European, Maori, Pacific People & Asian)
- Future – contribution (wood fires, vehicle onwership)

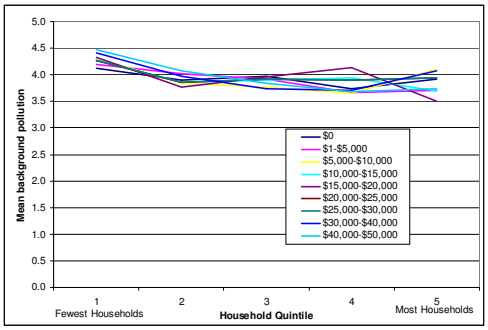
Results – Income vs all pollution



Results – Income vs all pollution



Results – Income vs background pollution



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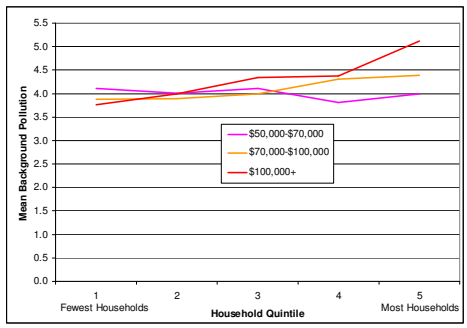
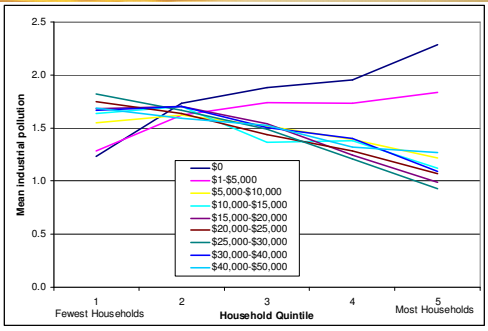


Results – Income vs industrial pollution



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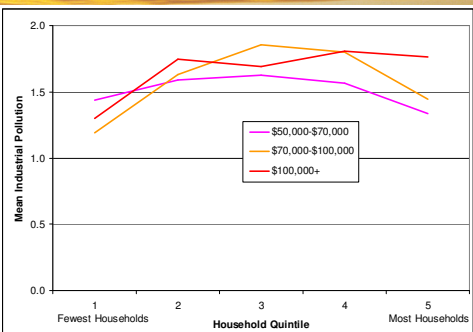
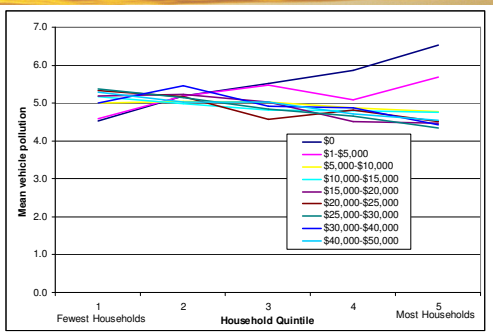


Results – Income vs vehicle pollution



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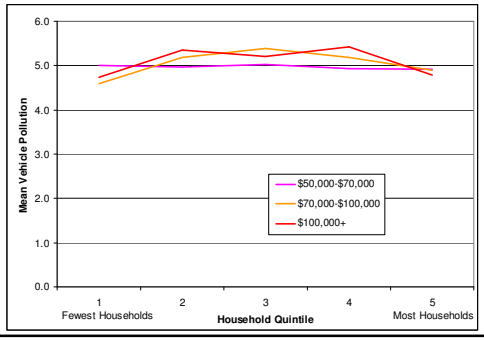
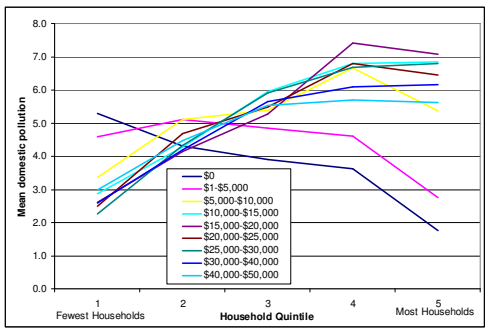


Results – Income vs domestic pollution



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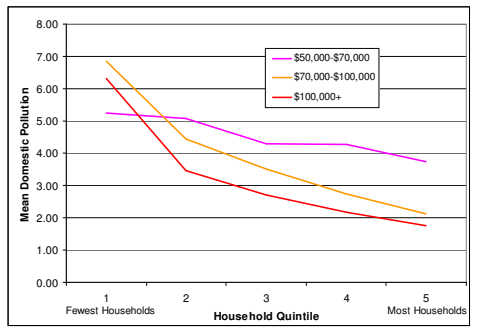
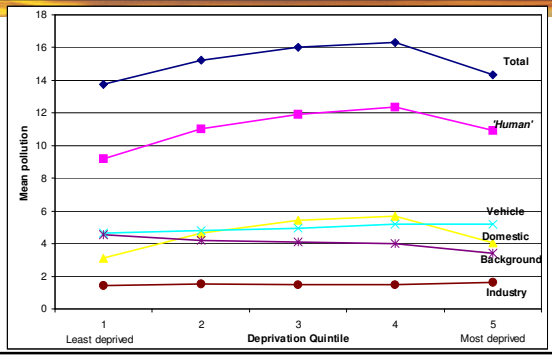


Results – income and pollution

- Areas with more people in low income groups have higher pollution levels and vice versa
  - $50,000 cut off
  - Background pollution - Higher for areas with more high incomes (living near coast?)
  - Industrial pollution - very low levels – little evidence of EJ except in lowest two income groups
  - Vehicle pollution – little evidence of EJ except in lowest two income groups
  - Domestic pollution – clear evidence of EJ except for lowest incomes

Results - NZDep



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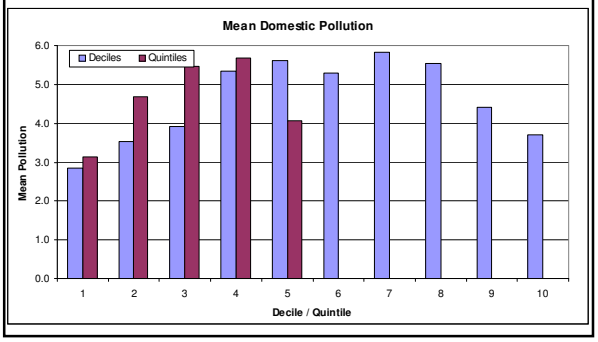


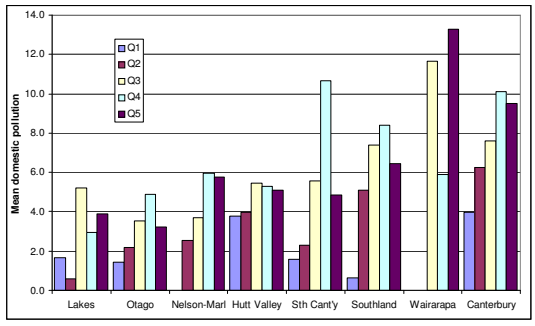
Results - NZDep

- For 'human' sources
  - Lower mean exposure in areas with more 'less deprived' households
  - Increased exposure as deprivation increases till we get to decile 8
  - Drop in mean exposure for areas with more 'deprived' (deciles 8-10) households
  - Differences due to domestic exposure
- Why?
  - Is it geography?
  - Is it NZDep?
  - Is it real?

Results – Is it geography?

- Is there a 'deprived' part of the country that has low domestic pollution e.g. rural poor?

Results – Is it geography?



Results – Is it geography?

- Is there a 'deprived' part of the country that has low domestic pollution e.g. rural poor?
- Ongoing – nothing obvious

Results – Is it NZDep?

- Is there something about NZDep that is producing these patterns?
- Ongoing – nothing obvious to date

Conclusions

- Fine spatial estimates of PM_{10} pollution for the whole of New Zealand – sub-divided by pollution source
- Some evidence of Environmental Inequity between domestic pollution and income and deprivation
  - Areas with more people of higher income and less deprivation have lower pollution exposure
  - But, lowest deprivation and income also have lower pollution exposure
  - Is this real?